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(71)Applicant : DAINIPPON SCREEN MFG CO
LTD

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(72)Inventor : IZUMI AKIRA
HIRAI NOBUYUKI
NIIHARA KAORU

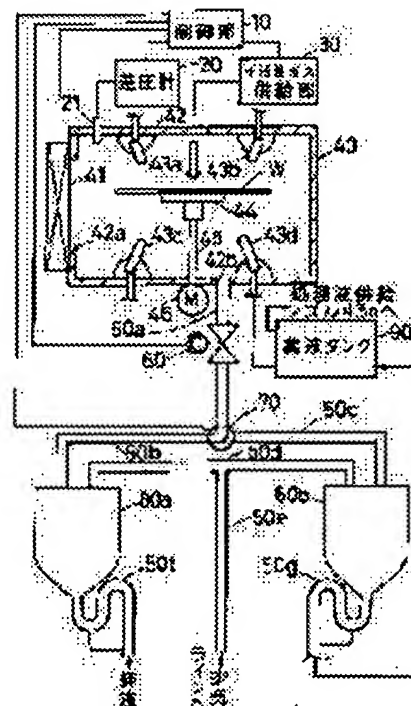
(54) SUBSTRATE TREATMENT APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a substrate treatment apparatus, capable of preventing the substrate from contamination caused by reverse diffusion of the mist of treatment liquid and capable of switching to discharge or collection of the liquid treatment.

SOLUTION: The liquid treatment (a washing lotion or a liquid chemical) and gas collected in the treatment bath 42 are exhausted together and, a washing lotion is sent to the gas-liquid separation container 80a and a liquid chemical is sent to the gas-liquid separation container 80b, switched by the switching valve 70. The liquid chemical or the washing lotion and the gas are separated in the gas-liquid separation container 80a and the gas-liquid separation container 80b, and the

separated gas is exhausted by the exhausting line, the liquid chemical separated in the gas-liquid separation container 80b is sent to the liquid chemical tank 90, and the washing lotion separated in the gas-liquid separation container 80a is discarded. Based on the signal from the differential pressure gauge 20, the opening angle of the exhausting resistance adjustment valve 60 is so controlled that the gas volume exhausted increases, when the hermetic shutter



41 is opened, and the gas volume exhausted decreases, when the hermetic shutter 41 is closed.

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CLAIMS

[Claim(s)]

[Claim 1] A processing liquid reservoir means is a substrate processor and store said 1st processing liquid to perform surface treatment of said substrate by choosing the 1st processing liquid and the 2nd processing liquid in predetermined sequence, and supplying them one by one on the surface of a substrate, A 1st processing liquid supply means to supply said 1st processing liquid to said substrate from said processing liquid reservoir means, The inside of a 2nd processing liquid supply means to supply said 2nd processing liquid to said substrate, and said 1st processing liquid and said 2nd processing liquid, The uptake means which carries out uptake with the ambient atmosphere which passed near the substrate by using as use after-treatment liquid the processing liquid supplied to said substrate at the time, Connect with said uptake means, and when the (i) aforementioned use after-treatment liquid is said 1st processing liquid The 1st condition of making the 1st discharge path discharging said said 1st processing liquid by which uptake was carried out, and the ambient atmosphere which passed near [said] the substrate, and when the (ii) aforementioned use after-treatment liquid is said 2nd processing liquid The 2nd condition of making the 2nd discharge path discharging said said 2nd processing liquid by which uptake was carried out, and the ambient atmosphere which passed near [said] the substrate, A 1st vapor-liquid-separation means to connect with the change bulb which can be switched at said 1st discharge path, and to separate said 1st processing liquid and the ambient atmosphere which passed near [said] the substrate, Feedback Rhine which returns said 1st processing liquid separated with said 1st vapor-liquid-separation means to said processing liquid reservoir means, A 2nd vapor-liquid-separation means to be connected with said 2nd discharge path, to separate said 2nd processing liquid and the ambient atmosphere which passed near [said] the substrate, and to derive said 2nd processing liquid to waste fluid Rhine, The substrate processor characterized by having an exhaust air derivation means to lead the ambient atmosphere which passed near [which was separated by each of said 1st vapor-liquid-separation means and said 2nd vapor-liquid-separation means / said] the substrate to exhaust air Rhine.

[Claim 2] In the substrate processor of claim 1 said substrate A closing motion detection means by which hold in the processing tub formed as a case which has the closing motion section, and said substrate processor detects the switching condition of said closing motion section, A flow regulation means to adjust the amount of outflow of the ambient atmosphere which was inserted in from the inert gas supply means which supplies inert gas in said processing tub, and said uptake means before said exhaust air derivation means, and passed near [said] the substrate to said exhaust air Rhine, The substrate processor characterized by having further the control means reduced rather than it can set said amount of outflow in the open condition of said closing motion means to a closed state by answering the detection result in said closing motion detection means, and driving said flow regulation means.

[Claim 3] The substrate processor characterized by being a means to set to the substrate processor of claim 2, and for said closing motion detection means to detect the internal and external differential pressure of said processing tub, and to detect said switching condition based on said differential pressure.

[Claim 4] It is the substrate processor characterized by said uptake means being the pars basilaris ossis occipitalis of a processing tub own [said] in the substrate processor of claim 3.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the substrate processor which performs various processings to that substrate by supplying penetrant removers, such as a drug solution and pure water, etc. to the front face of substrates (henceforth a "substrate"), such as a glass substrate for liquid crystal, and a semi-conductor wafer, (henceforth "processing liquid").

[0002]

[Description of the Prior Art] Drawing 9 shows the rotation processor of the substrate shown in JP,5-20321,U. This equipment is equipment which performs various processings to Substrate W by injecting two or more sorts of processing liquid Q1 and Q2, and penetrant removers Q3 and Q4 to Substrate W by Nozzles 108a-108d, holding Substrate W by the chuck 101 and rotating a chuck 101 in a horizontal plane.

[0003] this equipment -- the gutter material 115 for effluent circulation -- plane view -- the circular rotation base frame 116 -- the protection cylinder 104 -- bearing 107 -- minding -- a horizontal -- it is supported rotatable, the gutter 117 of the shape of the effluent opening 111 of the shape of long hole radii of the contents machine 110 and a ring which counters is formed in the top face of the rotation base frame 116, and a gutter 117 and the single effluent flowing-down opening 118 open for free passage protrude on the inferior surface of tongue of the rotation base frame 116. And each effluents Q1-Q4 which flow down from the effluent opening 111 with a big opening area do not leak, and uptake is carried out in a gutter 117, and they flow down from the effluent flowing-down opening 118.

[0004] Moreover, the drive motor 126 with which the rotation means 125 was fixed to the inferior surface of tongue of an outer container 120 through a fastener 123 and bearing 124, It consists of the drive gear 127 fixed to the driving shaft of a drive motor 126, and the ring gear 128 fixed to the periphery of the above-mentioned rotation base frame 116. The gutter material 115 for effluent circulation is rotated, and it is constituted so that location selection may be made and one drain openings 121a-121b (not shown [121 c.121d]) of the outer containers 120 may be made to face the effluent flowing-down opening 118.

[0005] You rotate the gutter material 115 for effluent circulation for every processing, and the effluent flowing-down opening 118 makes it located by such configuration on a thing predetermined [of the drain openings 121a-121b of an outer container 120 / different, respectively].

[0006] By this, drain opening different, respectively is made to flow down, and processing liquid Q1 and Q2 and the penetrant removers Q3 and Q4 after the use injected by Substrate W by Nozzles 108a-108d are classified, respectively, and are carrying out uptake.

[0007] Moreover, opening of the exhaust port 114 is carried out to the flank of the contents machine 110, and it is made to flow down an air current F from the up opening 113 of the contents machine 110, and it is constituted so that processing liquid Myst may be discharged from an exhaust port 114.

[0008]

[Problem(s) to be Solved by the Invention] By the way, with above equipment, the drain openings 121a-

121b and the exhaust port 114 which cannot maintain confidentiality since it is made into the device which can be switched between the gutter material 115 for effluent circulation and the drain openings 121a-121b, therefore perform discharge of processing liquid Q1 and Q2 or penetrant removers Q3 and Q4 are established independently.

[0009] Therefore, instead of collecting by type by changing processing liquid and the penetrant remover which are collected to every drain opening 121a - 121b in above equipment If it is going to realize the equipment which changes recovery and abandonment of the same processing liquid for two or more drain openings of every by the same device Ayr mixed in the processing liquid in drain opening of processing liquid by the reduced pressure in the chamber by the exhaust air from an exhaust port 114 is sucked up, or By being sucked up with the processing liquid with which Ayr in the pars basilaris ossis occipitalis of the contents machine 110 or the gutter material 115 for effluent circulation etc. was discharged by winding up by rotation of a substrate Myst of processing liquid etc. carried out the back diffusion of electrons into the chamber, it divided and there were a substrate [finishing / processing] and a problem of polluting the rear face.

[0010] This invention aims at offering the substrate processor which has the intention of conquest of the above-mentioned problem in the conventional technique, and prevents contamination of the substrate by the back diffusion of electrons of processing liquid Myst, and can switch discharge of processing liquid, and recovery.

[0011]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the equipment of claim 1 of this invention A processing liquid reservoir means is a substrate processor and store said 1st processing liquid to perform surface treatment of said substrate by choosing the 1st processing liquid and the 2nd processing liquid in predetermined sequence, and supplying them one by one on the surface of a substrate, A 1st processing liquid supply means to supply said 1st processing liquid to said substrate from said processing liquid reservoir means, The inside of a 2nd processing liquid supply means to supply said 2nd processing liquid to said substrate, and said 1st processing liquid and said 2nd processing liquid, The uptake means which carries out uptake with the ambient atmosphere which passed near the substrate by using as use after-treatment liquid the processing liquid supplied to said substrate at the time, Connect with said uptake means, and when the (i) aforementioned use after-treatment liquid is said 1st processing liquid The 1st condition of making the 1st discharge path discharging said said 1st processing liquid by which uptake was carried out, and the ambient atmosphere which passed near [said] the substrate, and when the (ii) aforementioned use after-treatment liquid is said 2nd processing liquid The 2nd condition of making the 2nd discharge path discharging said said 2nd processing liquid by which uptake was carried out, and the ambient atmosphere which passed near [said] the substrate, A 1st vapor-liquid-separation means to connect with the change bulb which can be switched at said 1st discharge path, and to separate said 1st processing liquid and the ambient atmosphere which passed near [said] the substrate, Feedback Rhine which returns said 1st processing liquid separated with said 1st vapor-liquid-separation means to said processing liquid reservoir means, A 2nd vapor-liquid-separation means to be connected with said 2nd discharge path, to separate said 2nd processing liquid and the ambient atmosphere which passed near [said] the substrate, and to derive said 2nd processing liquid to waste fluid Rhine, It has an exhaust air derivation means to lead the ambient atmosphere which passed near [which was separated by each of said 1st vapor-liquid-separation means and said 2nd vapor-liquid-separation means / said] the substrate to exhaust air Rhine.

[0012] The equipment of claim 2 is set to the equipment of claim 1. Moreover, said substrate A closing motion detection means by which hold in the processing tub formed as a case which has the closing motion section, and said substrate processor detects the switching condition of said closing motion section, A flow regulation means to adjust the amount of outflow of the ambient atmosphere which was inserted in from the inert gas supply means which supplies inert gas in said processing tub, and said uptake means before said exhaust air derivation means, and passed near [said] the substrate to said exhaust air Rhine, By answering the detection result in said closing motion detection means, and driving said flow regulation means, it has further the control means reduced rather than it can set said amount of

outflow in the open condition of said closing motion means to a closed state.

[0013] Moreover, it sets to the substrate processor of claim 2, said closing motion detection means detects the internal and external differential pressure of said processing tub, and the equipment of claim 3 is characterized by being a means to detect said switching condition based on said differential pressure.

[0014] Furthermore, the equipment of claim 4 is characterized by said uptake means being the pars basilaris ossis occipitalis of a processing tub own [said] in the substrate processor of claim 3.

[0015]

[Embodiment of the Invention]

[0016]

[The structural configuration and equipment array] of the gestalt of 1. 1st operation Drawing 1 is a block diagram in the substrate processor of the gestalt of implementation of the 1st of this invention. Hereafter, the structural outline configuration of this equipment is described using drawing 1. In addition, two or more drug solutions (equivalent to the "1st processing liquid") and penetrant removers (equivalent to the "2nd processing liquid") which are used for below are combined, and processing liquid, a call and the former, and the latter are used properly if needed.

[0017] It connects with the differential pressure gage 20 mentioned later, the inert gas feed zone 30, the closed mold shutter 41, the exhaust-back-pressure modulating valve 60, and the change bulb 70, although not illustrated further, it connects with the processing liquid supply nozzles 43a-43d etc., and a control section 10 performs timing control of those actuation etc.

[0018] It connects with the sensor 21 gone across and formed in the interior and the exterior of the substrate processing section 40 which are mentioned later, and a differential pressure gage 20 (equivalent to a "closing motion detection means") senses the atmospheric-pressure difference of substrate processing section 40 inside and outside, and sends the signal which shows it to a control section 10.

[0019] Piping connects with the substrate processing section 40 mentioned later, and the inert gas feed zone 30 supplies the nitrogen which is inert gas to the substrate processing section 40 according to control of a control section 10.

[0020] The substrate processing section 40 is equipped with the closed mold shutter 41, the processing tub 42, the processing liquid supply nozzles 43a-43d, a spin chuck 44, a driving shaft 45, and a motor 46, and it performs various substrate processings, rotating Substrate W inside.

[0021] The processing tub 42 is the case equipped with Openings 42a and 42b, and the closed mold shutter 41 is formed in the outside of opening 42a. The closed mold shutter 41 performs release and closing of opening 42a, and intercepts the alternating current of the ambient atmosphere of substrate processing section 40 inside and outside at the time of closing.

[0022] The processing liquid supply nozzles 43a-43d are nozzles which inject and supply processing liquid PR to Substrate W, among those the processing liquid supply nozzles 43a and 43d are connected to the drug solution tank 90 mentioned later, and they supply a drug solution to Substrate W. Moreover, the processing liquid supply nozzles 43b and 43c supply a penetrant remover (pure water) to Substrate W.

[0023] It is supported pivotable [the top face] in a horizontal plane, and it is in the condition which held Substrate W on the top face, and rotates with the rotation driving force of the motor 46 transmitted by the driving shaft 45, and, as for a spin chuck 44, various substrate processings are performed by supplying various processing liquid PR to Substrate W from the processing liquid supply nozzles 43a-43d in connection with it.

[0024] While piping 50a is connected to opening 42b prepared in the processing tub 42, it connects with the change bulb 70 via the exhaust-back-pressure modulating valve 60 mentioned later, and passes through the substrate neighborhood, and various processing liquid PR including the ambient atmosphere discharged from the substrate processing section 40 is fed in the interior.

[0025] Moreover, the exhaust-back-pressure modulating valve 60 adjusts the opening of the ambient atmosphere in piping 50a, and the passage of processing liquid PR suitably by control of a control

section 10.

[0026] When processing liquid PR is a penetrant remover, the change bulb 70 switches the ambient atmosphere from piping 50a, and the feeding place of processing liquid PR to piping 50b at piping 50c, when processing liquid PR is a drug solution.

[0027] Piping 50b, 50d, and 50f is connected to vapor-liquid-separation container 80a (equivalent to the "2nd vapor-liquid-separation means"), the ambient atmosphere and penetrant remover which were fed by piping 50b are divided into an ambient atmosphere and a penetrant remover, an ambient atmosphere is sent out to 50d of piping, and a penetrant remover is discarded through 50f of piping.

[0028] Similarly, Piping 50c, 50d, and 50g is connected to vapor-liquid-separation container 80b (equivalent to the "1st vapor-liquid-separation means"), a drug solution including the ambient atmosphere fed by piping 50c is divided into an ambient atmosphere and a drug solution, an ambient atmosphere is sent out to 50d of piping, and processing liquid is fed and collected on the drug solution tank 90 later mentioned through 50g of piping.

[0029] Piping 50e is connected to 50d of piping, further, it connects with exhaust air Rhine which is not illustrated, and 50d of piping exhausts the fed ambient atmosphere.

[0030] An important section is further explained to a detail.

[0031] The closed mold shutter 41 formed in the substrate processing section 40 is formed in the outside of opening 42a of the processing tub 42. It has composition which opens and closes opening 42a by the plate-like member which can go up and down freely. Elastic material intervenes between the plate-like member and the skin of the processing tub 42, and the outflow to the exterior of Myst of the inflow of the atmospheric air from the outside of the processing tub 42, an internal ambient atmosphere, processing liquid PR, etc., etc. is intercepted at the time of closing. And closing motion of the closed mold shutter 41 is performed while timing control is carried out by the control section 10, although explained in full detail behind, and it can open only in the case of carrying in of Substrate W and taking out, and is closed between substrate processings of the substrate W with other processing liquid PR etc.

[0032] The pars basilaris ossis occipitalis inside the processing tub 42 serves as the uptake tub of used processing liquid PR in substrate processing. Used and the excessive processing liquid PR which was not used with the inert gas supplied from the inert gas feed zone 30 among the processing liquid PR supplied to the substrate W on a spin chuck 44 After uptake is carried out by the processing tub 42, processing liquid PR including an ambient atmosphere is discharged by piping 50a through opening 42b.

[0033] The exhaust-back-pressure modulating valve 60 is equipped with the valve element controllable from the exterior all over the ambient atmosphere of that interior, or the passage of processing liquid PR, and adjusts automatically the flow rate of the ambient atmosphere and the processing liquid PR with which this valve element drives by control by the control section 10, and has the inside of piping 50a fed. In addition, a control section 10 adjusts the atmospheric pressure in the processing tub 42 by control of the opening of the passage by this exhaust-back-pressure modulating valve 60, and control of inert gas supply in the substrate processing section 40 from the inert gas feed zone 30 so that it may explain in full detail behind.

[0034] Moreover, drawing 2 and drawing 3 are the sectional views of the principal part of the change bulb 70. Hereafter, the configuration of the change bulb 70 is explained based on these drawings.

[0035] it is shown in drawing 2 -- as -- the change bulb 70 -- the core of a fixed part 73 -- the shape of a cylinder -- ***** -- him -- fitting of the rotation of the cylinder-like moving part 71 is made free to ***** and there centering on the center line CL. And between piping 50a connected to moving part 71 and its top face, it is the device in which rotation of moving part 71 does not get across to piping 50a by the bearing which is not illustrated. Moreover, it switches to the inferior surface of tongue of moving part 71 through a driving shaft, and the motor 74 is formed.

[0036] Moreover, one notching slot 71c is prepared in the peripheral face of moving part 71, and two notching slots 73c and 73d are similarly established in the fixed part 73. And fitting of O rings 77a-77c made from a spring material is carried out to each, and an ambient atmosphere and processing liquid PR leak from the clearance between moving part 71 and a fixed part 73.

[0037] Moreover, passage 72 is established in the interior between opening 71b prepared in the peripheral face of moving part 71 from inlet 71a prepared in the top face of moving part 71. Moreover, exhaust port 73a (equivalent to the 2nd exhaust port) and exhaust port 73b (equivalent to the 1st exhaust port) are prepared in two locations which counter a fixed part 73 at the opening 71b by 180 rotation centering on the center line CL of moving part 71, respectively.

[0038] Furthermore, passage 75 is connected with exhaust port 73a, and piping 50b is connected to the point. Passage 76 is similarly connected with exhaust port 73b, and piping 50b is connected to the point.

[0039] The change bulb 70 has the above composition, and when moving part 71 rotates 180 degrees centering on the center line CL by the drive of the switch motor 74, it can switch piping which leads to piping 50a to either of the piping 50b and 50c. That is, drawing 2 shows the condition that piping 50b was connected with piping 50a, and drawing 3 shows the condition that piping 50c was connected with piping 50a.

[0040] Thus, by the change bulb 70, processing liquid PR and the ambient atmosphere which were fed by piping 50a are switched by piping 50b and piping 50c in the feeding place. When processing liquid PR is a penetrant remover, piping 50b leads to a detail more at piping 50a, and when processing liquid PR is a drug solution, it is piping 50c.

[0041] Furthermore, the penetrant remover and ambient atmosphere which were fed into piping 50b are fed into vapor-liquid-separation container 80a. Moreover, the drug solution and ambient atmosphere which were fed into piping 50c are fed into vapor-liquid-separation container 80b.

[0042] Drawing 4 is the sectional view of vapor-liquid-separation container 80a. The upper part of vapor-liquid-separation container 80a is cylindrical, and the lower part has the shape of a cone made into vertical reverse, and except that 50f of piping is connected to the top face at piping 50b, 50d of piping, and a pars basilaris ossis occipitalis, it is sealed.

[0043] Piping 50b does not reach the pars basilaris ossis occipitalis of vapor-liquid-separation container 80a like illustration, but it is installed so that the tip may be located in a body. Moreover, 50f of piping is prepared in the pars basilaris ossis occipitalis of vapor-liquid-separation container 80a, and a penetrant remover is discarded through this.

[0044] Moreover, in the exterior of vapor-liquid-separation container 80a, the serpentine trap device is prepared in 50f of piping, and the back flow of an ambient atmosphere is prevented. Moreover, the point of the trap device of 50f of piping is extended caudad. Therefore, the oil level of the processing liquid PR in vapor-liquid-separation container 80a does not go up above the height of illustration. Therefore, the tip of piping 50b is not immersed in the processing liquid PR stored in the pars basilaris ossis occipitalis of vapor-liquid-separation container 80a. In addition, the appearance, and the die length of piping 50b and the exhaust air capacity from 50d of piping for the tip of piping 50b not to be immersed in the processing liquid stored in the pars basilaris ossis occipitalis of vapor-liquid-separation container 80a even if the inside of the processing tub 42 becomes negative pressure and the inside of vapor-liquid-separation container 80a becomes negative pressure are set up. In addition, 50h of another piping is prepared in the bottom of the trap device part of 50f of piping like illustration, and the other end joins 50f of piping again in the back of a trap device part. Furthermore, the stop valve 82 is formed in the middle of 50h of piping. This stop valve 82 can be opened to remove the processing liquid PR which collected on the trap device part of 50f of piping at the time of a maintenance etc. although closed at the time of normal actuation of this equipment.

[0045] Moreover, 50d of piping is prepared in the upper part of vapor-liquid-separation container 80a, it connects with the point further in exhaust air Rhine, and the ambient atmosphere with which was separated by suction of the exhaust air Rhine with processing liquid PR in vapor-liquid-separation container 80a, and the upper part was covered by it is exhausted compulsorily.

[0046] The ambient atmosphere in the substrate processing section 40 is attracted through Piping 50a and 50b by the strength according to the aperture degree of the exhaust-back-pressure modulating valve 60 by carrying out the forcible exhaust air of the ambient atmosphere in vapor-liquid-separation container 80a. In addition, since vapor-liquid-separation container 80a needs chemical resistance, it is formed of fluororesin, such as a vinyl chloride or PTFE.

[0047] Moreover, vapor-liquid-separation container 80b is also the same configuration.

[0048] By the way, a vapor-liquid-separation container as shown in drawing 8 as a comparison technique contrasted with these vapor-liquid-separation containers 80a and 80b can be considered. That is, it is sealed, except that piping 201 and 204 is formed in the top face of the vapor-liquid-separation container 200 and piping 202 is formed in the pars basilaris ossis occipitalis of the vapor-liquid-separation container 200. Moreover, the opposite edge of edge 201a besides the vapor-liquid-separation container of piping 201 is connected to the processing tub. Furthermore, a stop valve 203 is formed in piping 202, and the pump 205 is formed in piping 204. And if piping 201 is installed so that the edge 201a may be located near the pars basilaris ossis occipitalis in the vapor-liquid-separation container 200, therefore the vapor-liquid-separation container 200 is covered with processing liquid PR, it will be immersed in processing liquid PR by edge 201a of piping 201 like illustration.

[0049] Also when such a configuration is taken, it is possible to lower the atmospheric pressure in a processing tub. That is, the atmospheric pressure of the processing tub to which the pressure of processing liquid PR was lowered by carrying out the forcible exhaust air of the ambient atmosphere in the vapor-liquid-separation container 200 with a pump 205, and this lowered the atmospheric pressure in piping 201 indirectly, therefore piping 201 was connected is lowered.

[0050] However, with such a vapor-liquid-separation container, there is a fault that the depth of the processing liquid PR within the vapor-liquid-separation container 200 will differ, and the atmospheric pressure of substrate processing circles will change as a result with degrees of discharge of the processing liquid PR from the substrate processing section, therefore the delicate pressurization of substrate processing circles becomes difficult.

[0051] On the other hand, as the vapor-liquid-separation containers 80a and 80b in the gestalt of implementation of the 1st of this invention show to drawing 4, it is not concerned with the degree of discharge of the processing liquid PR from the substrate processing section 40 according to a trap device, but the oil level of processing liquid PR is fixed. And since processing liquid PR does not intervene between the ambient atmosphere of 50d of piping, and piping 50b, the atmospheric pressure in the substrate processing section 40 is not influenced by the discharge degree of processing liquid PR. Thereby, the delicate atmospheric-pressure accommodation in the substrate processing section 40 is possible.

[0052]

[Procedure in the gestalt of 2. 1st operation] Below, the procedure in the substrate processor of the gestalt of this 1st operation is explained.

[0053] Drawing 5 is the flow chart of the substrate processing in the substrate processor of the gestalt of the 1st operation. Hereafter, it explains using this flow chart. In addition, in the first phase, the closed mold shutter 41 is closed, within the substrate processing section 40, inert gas is supplied and Substrate W is not held on the spin-chuck 44 top face. Moreover, during all the following processings, a differential pressure gage 20 catching the differential pressure of processing tub 42 inside and outside based on the signal of a sensor 21, and transmitting the signal which shows it to a control section 10 is being continued.

[0054] First, while suspending supply of the inert gas into the substrate processing section 40 in step S1, the exhaust air of an ambient atmosphere which lowered the opening of the exhaust-back-pressure modulating valve 60, and led piping 50a is weakened. This makes isotonic the atmospheric pressure of substrate processing section 40 inside and outside.

[0055] Next in step S2, the closed mold shutter 41 of the substrate processing section 40 is opened, Substrate W is carried in to the interior of the substrate processing section 40, and Substrate W is held by the spin chuck 44.

[0056] Next, the closed mold shutter 41 is closed in step S3. Moreover, a control section 10 is caught by the rise of the atmospheric pressure in the processing tub 42 according that the closed mold shutter 41 was closed to the signal of a differential pressure gage 20, and it raises the opening of the exhaust-back-pressure modulating valve 60 while it begins to supply the inert gas into the substrate processing section 40 based on it.

[0057] A drug solution is injected towards Substrate W from the processing liquid supply nozzles 43a and 43d, rotating a spin chuck 44 in step S4, and rotating Substrate W next. Perform drug solution processing of Substrate W, and after that, supply a penetrant remover for drug solution supply to Substrate W from a stop and the processing liquid supply nozzles 43b and 43c, and washing processing of Substrate W is performed. Further after that, where Substrate W is rotated, penetrant remover supply is stopped, the rotational frequency of Substrate W is raised further, Substrate W shakes off, and desiccation processing is performed.

[0058] If it next judges whether processing of all the substrates W was completed in step S5 and processing of all the substrates W is not completed, when it returns to step S1, it moves to processing of the following substrate W and processing of all the substrates W is completed conversely, a series of substrate processings are ended.

[0059] As explained above, in the substrate processor of the gestalt of the 1st operation, the processing liquid PR and the ambient atmosphere by which uptake was carried out are collectively discharged by the processing tub 42. A penetrant remover and a drug solution in the vapor-liquid-separation containers 80a and 80b among processing liquid PR by the change of the change bulb 70, respectively Delivery, While discharging the ambient atmosphere which separated the penetrant remover and the ambient atmosphere by vapor-liquid-separation container 80a, furthermore separated the drug solution and the ambient atmosphere by vapor-liquid-separation container 80b, respectively, and was separated in the vapor-liquid-separation containers 80a and 80b by exhaust air Rhine Since the penetrant remover which fed into the drug solution tank 90 the drug solution separated by vapor-liquid-separation container 80b, and was separated by vapor-liquid-separation container 80a considered as the configuration to discard Since processing liquid PR serves as Myst since the ambient atmosphere is exhausted through piping 50a, and the processing tub 42 does not pull back, the back diffusion of electrons to the processing tub 42 of processing liquid Myst can be prevented, and abandonment of processing liquid PR and recovery can be switched. Moreover, the processing liquid PR collected by it is reusable, and while being able to reduce the cost concerning processing liquid PR, the waste fluid of a drug solution can also be reduced.

[0060] Moreover, while feeding into the drug solution tank 90 the drug solution which distributed the penetrant remover and drug solution by which uptake was carried out by the processing tub 42 to the vapor-liquid-separation containers 80a and 80b by the change bulb, respectively, and was separated by vapor-liquid-separation container 80b Since the penetrant remover separated by vapor-liquid-separation container 80a considered as the configuration to discard When changing abandonment and recovery by the drug solution and the penetrant remover, respectively, the drug solution to collect and the penetrant remover to discard are not mixed within the vapor-liquid-separation containers 80a and 80b, till then piping 50b, and 50c. After recovery, processing liquid PR can be divided into a drug solution and a penetrant remover, or the time and effort of refining can be saved, and efficient drug solutions can be collected.

[0061] Moreover, when the opening of the exhaust-back-pressure modulating valve 60 is adjusted and the closed mold shutter 41 is open with the control section 10 based on the signal of a differential pressure gage 20, the discharge of the ambient atmosphere from the processing tub 42 is made [many], and it writes as the configuration controlled to lessen the discharge of the ambient atmosphere when the closed mold shutter 41 has closed, and the atmospheric pressure in the processing tub 42 becomes high from the time of the direction when the closed mold shutter 41 is open having closed. For this reason, since flow of the ambient atmosphere which goes outside from the inside of the processing tub 42 is made when having opened the closed mold shutter 41 and the inflow of the oxygen which can control that atmospheric air flows in the processing tub 42, therefore forms an unnecessary oxide film on particle or Substrate W in a processing tub can be controlled, contamination of Substrate W can be prevented.

[0062] Furthermore, the pars basilaris ossis occipitalis of the processing tub 42 can write as the configuration which serves as the uptake tub, and can mitigate the cost by making a processing tub and an uptake tub separately, respectively.

[0063]

[The gestalt of 3. 2nd operation] Drawing 6 is a block diagram in the substrate processor of the gestalt of the 2nd operation. Hereafter, this equipment is explained using drawing 6.

[0064] With the equipment of the gestalt of the 2nd operation, the exhaust-back-pressure modulating valve 60 prepared in piping 50a in the equipment of the gestalt of the 1st operation is removed, instead the exhaust-back-pressure modulating valves 60a and 60b are formed in piping 50b and piping 50c, respectively, and they are further connected with a control section 10. And in case processing by the drug solution is performed as processing liquid PR, the feeding place of the drug solution from piping 50a is piping 50c, and controls exhaust-back-pressure modulating valve 60b by the change of the change bulb 70 in this case. Conversely, in case the same timing control as the equipment of the gestalt of the 1st operation is performed and processing by the penetrant remover is performed as processing liquid PR, the feeding place of the penetrant remover from piping 50a is piping 50b, and controls exhaust-back-pressure modulating valve 60a by the change of the change bulb 70 in this case.

[0065] Other configurations are the same as that of the equipment of the gestalt of the 1st operation.

[0066] In addition to having the same effectiveness as the equipment of the gestalt of the 1st operation, by the above configurations, the equipment of the gestalt of the 2nd operation has the following characteristic effectiveness.

[0067] Namely, although the case where it is said that the broken substrate W etc. is stuck for the exhaust-back-pressure modulating valve 60, and it is hard to take out can be considered when Substrate W can be broken in the processing tub 42 in the equipment of the gestalt of the 1st operation and it flows into piping 50a with processing liquid PR With the equipment of the gestalt of the 2nd operation, since the conductance bulb is not connected to piping 50a, the broken substrate W got blocked in piping 50a can be removed comparatively easily, and its maintenance nature improves.

[0068]

[The gestalt of 4. 3rd operation] Drawing 7 is a block diagram in the substrate processor of the gestalt of the 3rd operation. Hereafter, this equipment is explained using drawing 7.

[0069] With the equipment of the gestalt of the 3rd operation, the exhaust-back-pressure modulating valve 60 prepared in piping 50a in the equipment of the gestalt of the 1st operation is removed, instead the exhaust-back-pressure modulating valve 60 is formed in piping 50e, and it is further connected with a control section 10. And the same timing control as the equipment of the gestalt of the 1st operation is performed.

[0070] Other configurations are the same as that of the equipment of the gestalt of the 1st operation.

[0071] The equipment of the gestalt of the 3rd operation is equipped with the same effectiveness as the equipment of the gestalt of the 2nd operation by the above configurations. By namely, accommodation of the exhaust pressure of the ambient atmosphere from the vapor-liquid-separation containers 80a and 80b according to the exhaust-back-pressure modulating valve 60 in addition to the effectiveness of the equipment of the gestalt of the 1st operation Since the atmospheric pressure in the processing tub 42 can be directly adjusted with the property of the above-mentioned vapor-liquid-separation containers 80a and 80b Since the exhaust-back-pressure modulating valve 60 could perform exhaust-pressure control of the same ambient atmosphere as the equipment of the gestalt of the 1st operation also as a configuration prepared in piping 50e and the conductance bulb was moreover removed from piping 50a It also has the effectiveness that the maintenance nature at the time of getting piping 50a blocked also improves.

[0072] Furthermore, the equipment of the gestalt of the 3rd operation has more effective effectiveness to the equipment of the gestalt of the 2nd operation. That is, although two conductance bulbs of the exhaust-back-pressure modulating valves 60a and 60b were needed, and those control also had to switch both and had to be further performed with the equipment of the gestalt of the 2nd operation, since it ends with the equipment of the gestalt of the 3rd operation with one exhaust-back-pressure modulating valve 60, cost can also be reduced and it has the effectiveness that the effectiveness of control also improves.

[0073]

[5. modification] Although considered as the configuration which uses one kind of drug solution, and a penetrant remover as processing liquid with the substrate processor of the gestalt of the 1st - the 3rd operation as mentioned above Only the drug solutions of a specific class are collected to the substrate

processing using two or more sorts of drug solutions. What is necessary is for it to be good also as a configuration which discards other drug solutions and penetrant removers, and to equip only the number of classes of a drug solution with recovery networks, such as a drug solution tank, a vapor-liquid-separation container, and piping, and to consider it as the configuration using the change bulb which switches piping of these plurality in that case.

[0074] Moreover, although considered as the configuration which discards a penetrant remover in the substrate processor of the gestalt of the 1st - the 3rd operation, it can also consider as the configuration which also collects penetrant removers.

[0075] Moreover, although considered as the configuration which carries out rotation processing of the substrate in the substrate processor of the gestalt of the 1st - the 3rd operation, this invention is also applicable to the equipment which processes while carrying out advancing-side-by-side conveyance.

[0076] Moreover, although considered as the configuration which injects processing liquid to a substrate by the processing liquid supply nozzle in the substrate processor of the gestalt of the 1st - the 3rd operation, this invention is also applicable also to the equipment which applies processing liquid on a substrate.

[0077] Moreover, although considered as the configuration which performs exhaust-pressure control based on a differential pressure gage in the substrate processor of the gestalt of the 1st - the 3rd operation, it is good also as a configuration which performs exhaust-pressure control to the timing which transmits the keying signal of a closed mold shutter by the control section, and further, closing motion of a closed mold shutter can be caught by the optical sensor, and it can also consider as the configuration which performs exhaust-pressure control based on it.

[0078] Furthermore, although considered as the configuration which equips each network of abandonment and recovery of processing liquid with a vapor-liquid-separation container, respectively in the substrate processor of the gestalt of the 1st - the 3rd operation, it is good also as a configuration which is equipped with one vapor-liquid-separation container, prepares a change bulb in piping which discharges the processing liquid of the vapor-liquid-separation container, and switches the discharge place of the processing liquid from there by abandonment and recovery.

[0079]

[Effect of the Invention] As explained above, in invention of claim 1 - claim 4 The inside of said 1st processing liquid and said 2nd processing liquid, In an uptake means, uptake is carried out with the ambient atmosphere which passed near the substrate by using as use after-treatment liquid the processing liquid supplied to said substrate at the time. By the change by the change bulb, when the use after-treatment liquid is the 1st processing liquid The 1st discharge path is made to discharge the 1st processing liquid by which uptake was carried out, and the ambient atmosphere which passed near the substrate, and when the use after-treatment liquid is the 2nd processing liquid conversely, the 2nd discharge path is made to discharge the 2nd processing liquid by which uptake was carried out, and the ambient atmosphere which passed near the substrate.

[0080] And the 1st vapor-liquid-separation means connected with the 1st discharge path separates the 1st processing liquid and the ambient atmosphere which passed near the substrate, and by feedback Rhine, the 1st processing liquid of them is returned to a processing liquid reservoir means, and is collected. Moreover, with the 2nd vapor-liquid-separation means connected with said 2nd discharge path, the 2nd processing liquid and the ambient atmosphere which passed near the substrate are separated, and the 2nd processing liquid is drawn and discarded to waste fluid Rhine. Furthermore, with an exhaust air derivation means, the ambient atmosphere which passed near [which was separated by each of the 1st vapor-liquid-separation means and the 2nd vapor-liquid-separation means] the substrate is led to exhaust air Rhine, and is exhausted.

[0081] Since it considered as the above configurations, since the ambient atmosphere which passed near the substrate was summarized with use after-treatment liquid and discarded, the use after-treatment liquid serves as Myst, and an uptake means does not pull back, the back diffusion of electrons into the processing tub of processing liquid Myst can be prevented, and abandonment of processing liquid and recovery can be switched. Moreover, the processing liquid collected by it is reusable, and while being

able to reduce the cost concerning processing liquid, the waste fluid of processing liquid can also be reduced.

[0082] Moreover, a change bulb distributes the use after-treatment liquid of the 1st processing liquid by which uptake was carried out with the uptake means, or the 2nd processing liquid to the 1st vapor-liquid-separation means and the 2nd vapor-liquid-separation means. While returning the 1st processing liquid separated with the 1st vapor-liquid-separation means to a processing liquid reservoir means by feedback Rhine Since the 2nd processing liquid separated with the 2nd vapor-liquid-separation container was considered as the configuration drawn and discarded to waste fluid Rhine It is rare to mix the 1st processing liquid to collect and the 2nd processing liquid to discard within the 1st vapor-liquid-separation means and the 2nd vapor-liquid-separation means, or the piping till then, when changing abandonment and recovery for every class of two or more processing liquid. The time and effort of separating and refining the 1st processing liquid after recovery can be saved, and the efficient 1st processing liquid can be collected.

[0083] In addition to the above-mentioned effectiveness, it sets to the substrate processor of claim 2 - claim 4. Moreover, a substrate Hold in the processing tub formed as a case which has the closing motion section, and the detection result in a closing motion detection means to detect the switching condition of the closing motion section is answered. By driving a flow regulation means to adjust the amount of outflow of the ambient atmosphere which was inserted in from an uptake means before an exhaust air derivation means by the control means, and passed near the substrate to exhaust air Rhine by it It writes as the configuration reduced rather than it can set the amount of outflow in the open condition of the closing motion means of a processing tub to a closed state. Since flow of the ambient atmosphere which goes outside from the inside of a processing tub by the atmospheric pressure in a processing tub becoming high from the time of the direction when the closing motion means is open having closed is made Since the inflow of the oxygen which can control that atmospheric air flows in a processing tub, therefore forms an unnecessary oxide film on particle or a substrate in a processing tub can be controlled when having opened the closing motion means, contamination of a substrate can be prevented.

[0084] Furthermore, in addition to the above-mentioned effectiveness, by invention of claim 4, an uptake means can be written as the configuration which is the own pars basilaris ossis occipitalis of a processing tub, and the cost by manufacturing an uptake means and a processing tub separately, respectively can be mitigated.

[Translation done.]